



# PROCEEDINGS OF THE THIRTEENTH ANNUAL ACQUISITION RESEARCH SYMPOSIUM

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## WEDNESDAY SESSIONS VOLUME I

### **Federal Research and Development Contract Trends and the Supporting Industrial Base, 2000–2014**

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**Published April 30, 2016**

Approved for public release; distribution is unlimited.

Prepared for the Naval Postgraduate School, Monterey, CA 93943.



ACQUISITION RESEARCH PROGRAM  
GRADUATE SCHOOL OF BUSINESS & PUBLIC POLICY  
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The research presented in this report was supported by the Acquisition Research Program of the Graduate School of Business & Public Policy at the Naval Postgraduate School.

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## Panel 10. Assessing Industrial Base Implications of a Constrained Fiscal Climate

Wednesday, May 4, 2016

3:30 p.m. – 5:00 p.m. **Chair: Lorna B. Estep**, Director, Resource Integration and Deputy Chief of Staff for Logistics, Engineering, and Force Protection, Headquarters U.S. Air Force

**Discussant: Emily Harman**, Director, Department of the Navy, Office of Small Business Programs

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***Identifying and Mitigating the Impact of the Budget Control Act on High Risk Sectors and Tiers of the Defense Industrial Base: Assessment Approach to Industrial Base Risks***

Lirio Avilés, Engineer, MIBP, OUSD(AT&L)  
Sally Sleeper, Senior Advisor, MIBP, OUSD(AT&L)



# Federal Research and Development Contract Trends and the Supporting Industrial Base, 2000–2014

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## Abstract

As the current budget drawdown has progressed, numerous policy makers and informed observers have expressed concerns about the effect on federal research and development (R&D) efforts. Across the federal government, but particularly within the Department of Defense (DoD), there have been fears that the sharp downturn in federal contract obligations would disproportionately impact the R&D contracting portfolios within individual agencies and their major components.

Looking at the period from 2000–2014, this report examines data for the four major R&D contracting agencies: the DoD, NASA, the HHS, and the Department of Energy. It also examines four hypotheses, generated by the study team from a review of the literature and consultation with experts, that test how the budget drawdown has affected the R&D



contracting portfolios, and the industrial base that supports those efforts, within each R&D contracting agency.

The main finding of this initial inquiry is that the conventional wisdom regarding how R&D contracting would be affected by the budget drawdown has not been borne out. Early stage, “seed corn” R&D has been relatively protected, cuts were not done within agencies on a “salami slice” basis, and large prime vendors have seen their shares of the federal R&D contracting market decline precipitously.

## Introduction

As the current budget drawdown, resulting from fiscal restraints imposed by the Budget Control Act, as well as sequestration and its aftermath, has progressed, numerous policy makers and informed observers have expressed concerns about the effect on federal research and development (R&D) efforts. Across the federal government, but particularly within the Department of Defense (DoD), there have been fears that the sharp downturn in federal contract obligations would disproportionately impact the R&D contracting portfolios within individual agencies and their major components. Using data from the publicly-available Federal Procurement Data Systems (FPDS), this report examines trends with federal R&D contracting during the current drawdown and analyzes the degree to which actual data conforms to predicted trends.

In order to analyze trends within the R&D contracting portfolios of the four largest federal R&D customers (the DoD, Department of Energy [DoE], National Aeronautics and Space Administration (NASA), and Department of Health & Human Services [HHS]), CSIS has developed a methodology to categorize R&D contracts by stage of R&D using a categorization schema that roughly corresponds to the commonly-used DoD R&D Budget Activity Codes (BACs):<sup>1</sup>

- Basic Research (6.1)
- Applied Research (6.2)
- Advanced Technology Development (ATD) (6.3)
- Advanced Component Development & Prototypes (ACD&P; 6.4)
- System Development & Demonstration (SD&D; 6.5)
- Operational Systems Development (6.7)
- Operation of Government R&D Facilities (GOCO)<sup>2</sup>

The following section (Federal R&D Contracting in Context) looks at the overall trends for federal R&D, both by which federal agency or major component is doing the contracting and by what stage of R&D the work falls under. The next section after that—How Has the Budget Drawdown Affected Federal R&D Contracting?—examines four hypotheses regarding how federal R&D will be affected by the budget drawdown, drawn from the literature and from consultation with experts, and examines how well the data conforms to those predictions.

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<sup>1</sup> CSIS does not include contracts for R&D Management Support (6.6) in this analysis.

<sup>2</sup> Though not classified as R&D in the FPDS, CSIS now includes the codes for management/operation of federal R&D facilities in its R&D category, as a significant amount of R&D activity, particularly in the DoE, is structured in this manner.

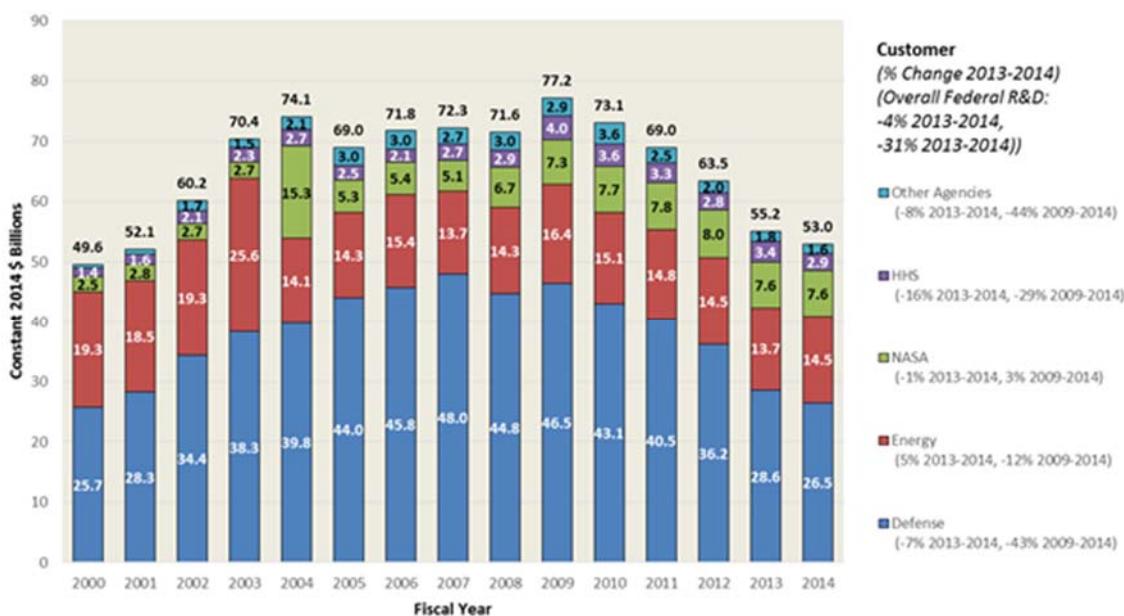


Based on the available data, the study concludes that most of the assumptions that the study team, policy makers, and outside experts made about the impact of the budget drawdown on federal R&D contracting were not borne out. While R&D contracting portfolios in some parts of the federal government saw dramatic cuts, others were relatively preserved, and the distribution of those cuts did not conform to expectations.

## Federal R&D Contracting in Context

Four federal agencies have accounted for 95% or more of total federal R&D contract obligations in every year since 2000: the DoD, the DoE, NASA, and the HHS. Of these, the DoD accounts for by far the largest share, with over 50% in every year during the 2000–2014 period, reaching as high as 66% in 2007. The DoE accounted for 39% of total federal R&D contract obligations in 2000, but has accounted for between 20% and 25% in most years since 2004. NASA, which accounted for between 4% and 5% of federal R&D contract obligations from 2000–2003, has seen steady growth since then and has accounted for double-digit shares in every year since 2009. Meanwhile, the HHS has accounted for between 3% and 5% of total federal R&D contract obligations in all but one year in the 2000–2014 period (6% in 2013).

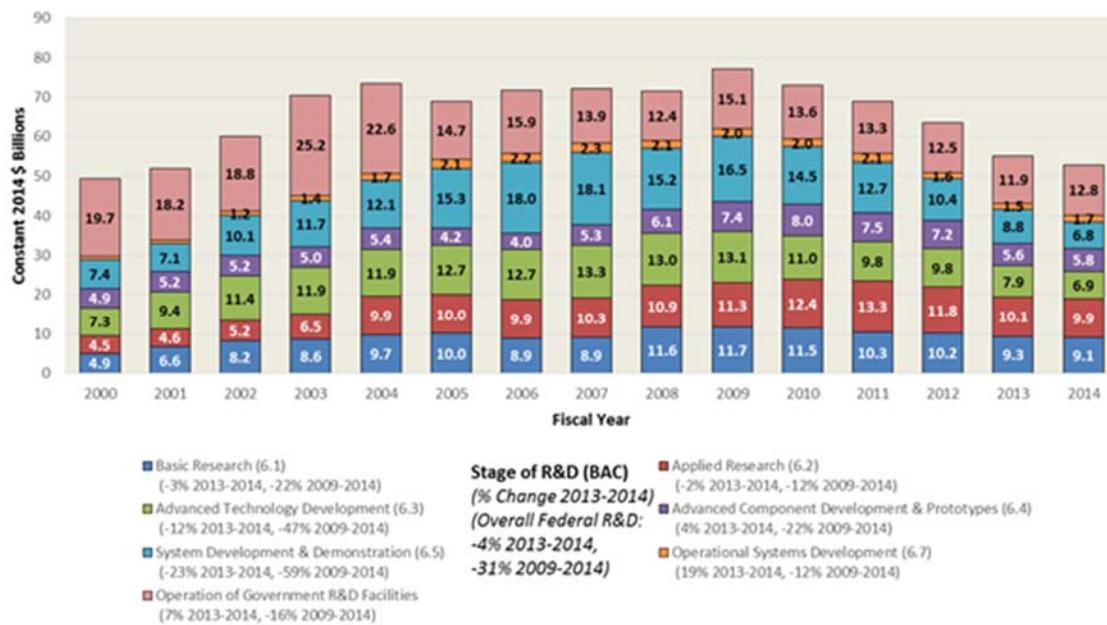
Figure 1 shows overall federal R&D contract obligations, broken down by customer, with the federal-wide total for each year at the top of each column.



**Figure 1. Federal R&D Contract Obligations by Customer, 2000–2014**  
(Federal Procurement Data Systems [FPDS]; CSIS analysis)

Since their peak in 2009, as overall federal contract obligations declined by 26%, federal R&D contract obligations have declined by 31%. Interestingly, most of this disproportionate decline in federal R&D contracts occurred prior to the impact of sequestration—since 2012, as overall federal contract obligations declined by 16%, federal R&D contract obligations fell roughly in parallel (-17%), with similarly parallel declines in both 2013 and 2014.

To better understand trends within the federal R&D contracting portfolio, CSIS has created a methodology to classify R&D contracts by stage of R&D, using the widely-understood Budget Activity Codes (BACs) as a guide. Figure 2 shows federal R&D contract obligations by stage of R&D.



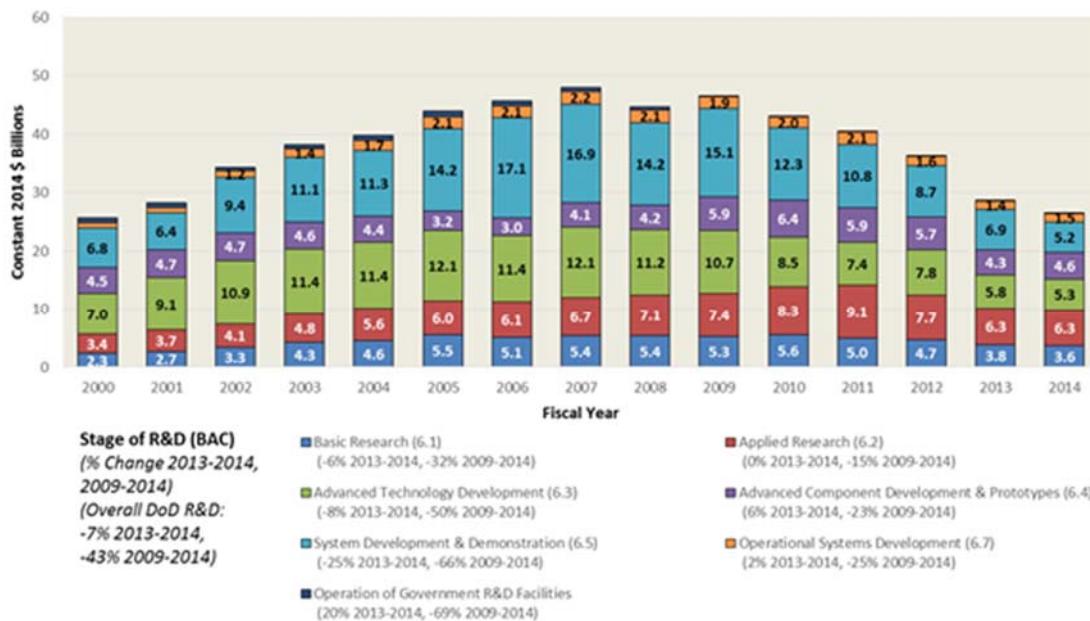
As overall federal R&D contract obligations declined by 31% since 2009, Basic Research (-22%), Applied Research (-12%), ACD&P (-22%), Operational Systems Development (-12%), and GOCO (-16%) were all relatively preserved. Meanwhile, ATD (-47%) and SD&D (-59%) both saw dramatic, disproportionate declines. As a share of overall federal R&D contract obligations, Basic Research and Applied Research, combined, rose from 30% in 2009 to 36% in 2014. Meanwhile, ATD fell from 17% to 13%, and SD&D declined from 21% in 2009 to 13% in 2014. Overall, the current drawdown has seen a notable shift within the federal R&D contracting portfolio, with a greater share of obligations going to early stage, “seed corn” R&D. The drivers of this trend will be analyzed in the sections that follow, which will look at the R&D contracting portfolios within the major federal R&D customers.

### Department of Defense<sup>3</sup>

Since 2009, DoD R&D contract obligations have declined by 43%, notably faster than the 31% decline in overall DoD contract obligations over this same period. As a share of overall DoD contract obligations, R&D declined from 11% in 2009 to 9% in 2014, the lowest share seen in the 2000–2014 period.

<sup>3</sup> Portions of this section are adapted from CSIS’ January 2016 report on overall Defense Acquisition Trends, which drew in part upon research and analysis done in preparation for this research effort.

Throughout the budget drawdown, numerous policy makers have expressed concern that the DoD would end up sacrificing investment in “seed corn” R&D in order to preserve funding for later stage, more established development programs. But as Figure 3 shows, that has not been the case.



**Figure 3. DoD R&D Contract Obligations by Stage of R&D, 2000–2014**  
(FPDS; CSIS analysis)

Since 2009, as overall DoD R&D contract obligations declined by 43%, obligations for Applied Research declined by just over one-third that rate (-15%),<sup>4</sup> while obligations for Basic Research declined by only 32%. As a share of DoD R&D contract obligations, the two “seed corn” categories rose from 27% in 2009 to 38% in 2014, the highest share in the 2000–2014 period. Basic Research contract obligations have declined at a rate that more closely parallels the overall decline in DoD R&D contract obligations since 2012, but Applied Research obligations have continued to be relatively preserved (-18% decline since 2012, compared to -27% for overall DoD R&D.)

Contract obligations for ACD&P (-23%) and Operational Systems Development (-25%) have similarly been relatively preserved since 2009. But ATD (-50%) and SD&D (-66%) have seen massive declines in recent years. The declines in those two stages of R&D accounted for over three-quarters of the total decline in DoD R&D contract obligations during the current drawdown.

The enormous decline in SD&D is particularly telling and speaks to the larger trend in DoD R&D contracting—over the last several years, as R&D programs related to MDAPs

<sup>4</sup> DoD contract obligations for Applied Research actually saw a notable spike between 2009 and 2011, due primarily to a one-year spike for space-related R&D, but obligations returned to prior levels in 2012.

have either been canceled or matured into production, the DoD has been largely unable to start and sustain new development programs, either due to budgetary pressures or to programmatic difficulties. The decline in R&D contract obligations during the budget drawdown is being driven by a five-year trough in the pipeline of new major weapons systems.

The following sections will briefly examine trends in R&D contracting within the three military services.

### **Army**

The key factor in the massive decline in Army R&D contract obligations (-61% since 2009, compared to -52% for Army contracts overall) has been the cancellation of the Army's Future Combat Systems (FCS) program. Nearly the entirety of the decline in Army R&D contract obligations between 2009 and 2012 is directly attributable to the cancellation and winding-down of the FCS. In particular, obligations for SD&D have declined by an incredible 94% since 2009 as the Army has struggled to start and sustain new development programs for major weapons systems in the wake of the FCS's cancellation. The result of these struggles is the current five-year trough in the Army's development pipeline for major weapons systems.

In terms of "seed corn" R&D, the trend within the Army is mixed. Both Basic Research (-45%) and Applied Research (-49%) have been relatively preserved since 2009. While Basic Research fell more slowly than overall R&D throughout the period, Army obligations for Applied Research actually grew between 2009 and 2011, before declining by nearly half in 2013. In 2014, combined obligations for the two "seed corn" categories are at their lowest level (\$1.6 billion) in the 2000–2014 period.

This interruption of the developmental pipeline for new major weapons systems presents an unusual opportunity for the DoD and, particularly, for the Army. As spending on war materiel continues to be replaced by funding for next-generation priorities, the Army has little to no developmental money already committed to projects. Thus, the Army has an opportunity to take a step back, draw lessons from the wars in Iraq and Afghanistan, evaluate potential future threats and missions, and direct their requirements and developmental priorities accordingly.

### **Navy**

While overall Navy contract obligations were relatively preserved (-19%) since 2009, Navy R&D contract obligations fell by 47% over that same period. As a share of overall Navy contract obligations, R&D fell from 14% in 2009 to 9% in 2014, the lowest share for the Navy in the 2000–2014 period.

Whereas obligations for Advanced Research have increased by 3% over the 2009–2014 period, obligations for Basic Research have declined by two-thirds since 2009. As with the Army, the Navy saw disproportionate declines in obligations for ATD (-68%) and SD&D (-53%). Unlike the Army, the Navy has major development programs in the pipeline, such as the Ohio-class ballistic missile submarine replacement. However, to preserve funding for current priorities, the Navy has been forced to push back the timelines for some of its efforts due to budgetary constraints, resulting in the ongoing trough in the Navy's development pipeline.



### **Air Force**

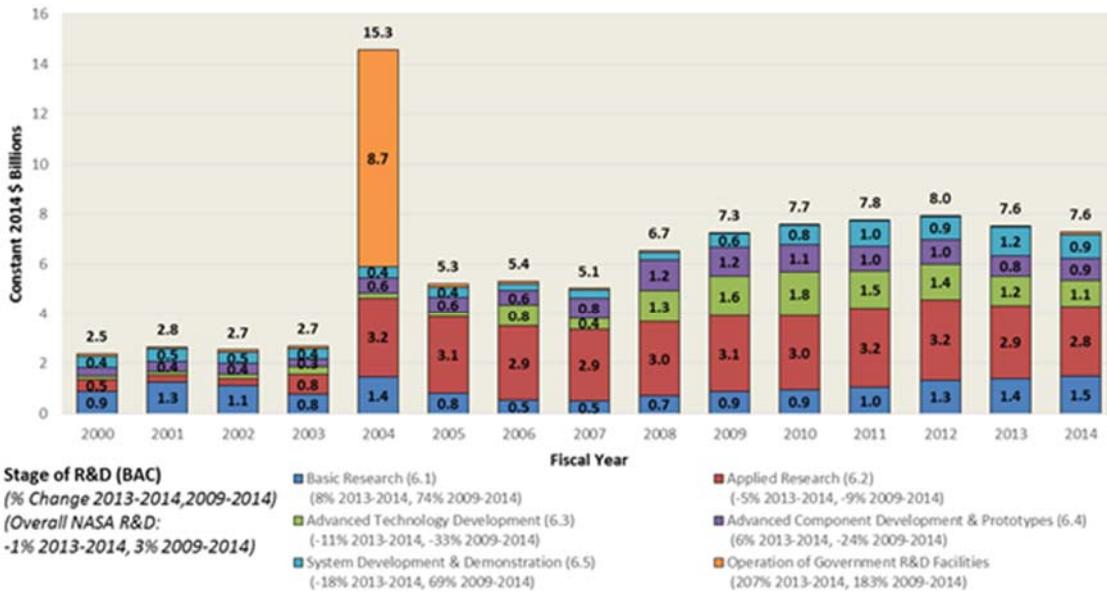
As with the Navy, while overall Air Force contract obligations were relatively preserved (-24%) since 2009, R&D contract obligations within the Air Force declined more steeply (-37%) over that same period. Analogous to the Army and Navy, Air Force contract obligations for Applied Research were relatively preserved since 2009 (-3%); unlike the Navy, Basic Research was also relatively preserved (-25%) and actually increased by 11% in 2014. As a share of Air Force R&D contract obligations, “seed corn R&D” rose from 41% in 2009 to 58% in 2014, the highest share in the 2000–2014 period.

Both ATD (-64%) and SD&D (-58%) declined heavily, with most of the declines coming in the wake of sequestration between 2012 and 2013. Unlike both the Army and Navy, however, Air Force contract obligations for ACD&P also declined heavily (-60%) since 2009. The Air Force is also in the midst of a trough in their development pipeline for new major weapons systems, but with contracts recently awarded for major programs like the Long Range Strike Bomber, the Air Force seems like it will be the first of the military services to emerge from this trough.

### **NASA**

NASA’s R&D contract portfolio is the most comparable with the DoD’s in terms of the types of projects undertaken, if not in overall scale. Basic Research and Applied Research have combined to account for over half of NASA contract obligations in all but one year in the 2000–2014 period, peaking at 73% in 2005. In recent years, Applied Research has accounted for around 40% of overall NASA R&D contract obligations, with ATD and ACD&P declining as a share as SD&D obligations grew. Figure 4 shows NASA R&D contract obligations by stage of R&D.





**Figure 4. NASA R&D Contract Obligations by Stage of R&D, 2000–2014<sup>5</sup>**  
(FPDS; CSIS analysis)

Unlike the DoD, NASA R&D contract obligations have risen steadily since 2007, with the most significant growth occurring between 2007 and 2009, primarily in ATD. NASA R&D contract obligations grew by 9% between 2009 and 2012, fell by 6% in 2013, and by a further 1% in 2014; for the entire 2009–2014 period, NASA contract obligations grew by 3%, even as overall NASA contract obligations fell by 10%. Since 2012, R&D has accounted for over half of NASA contract obligations, the highest shares (excluding the anomalous 2004) in the 2000–2014 period.

The increase in R&D contract obligations within NASA since 2009 has been driven by significant increases in Basic Research (74%) and SD&D (69%), while obligations for Applied Research (-9%), ATD (-33%), and ACD&P (-24%) declined notably.

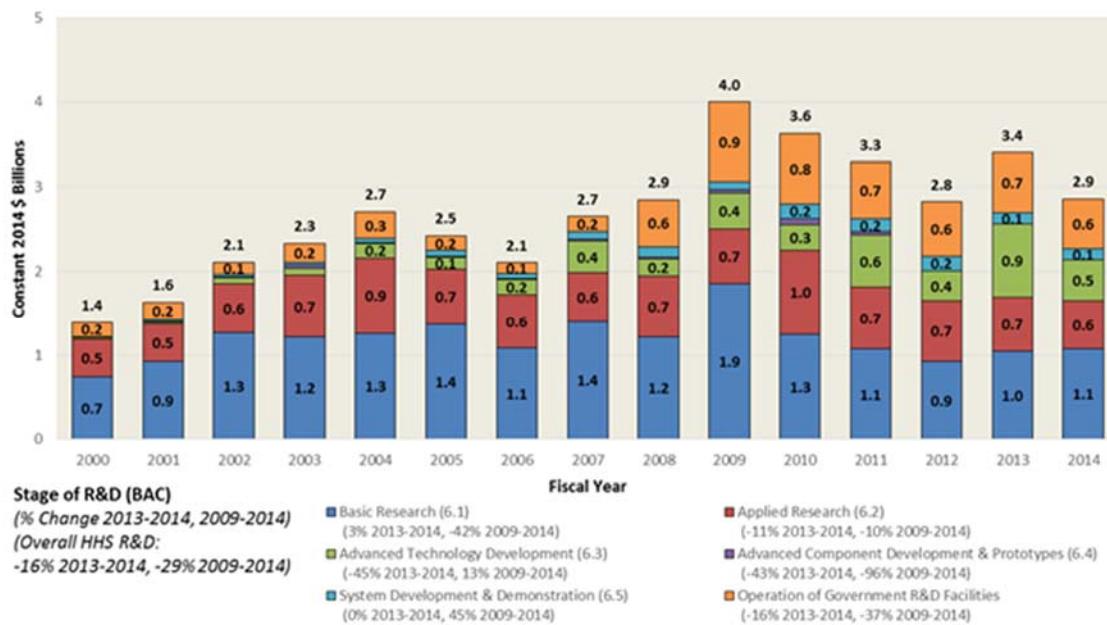
#### Department of Health and Human Services

The R&D contracting portfolio of the HHS has diversified notably in recent years. In 2000, Basic Research and Applied Research combined to account for 86% of HHS R&D contract obligations; by 2014, that share had declined to 57%. Obligations for the two categories of “seed corn” R&D have both been relatively stable over the 2000–2014 period;

<sup>5</sup> The \$8.7 billion in 2004 for “Operation of Government R&D Facilities” is a data anomaly related to NASA’s migration from their previous contract data system into FPDS. In the prior system, large, multiyear contracts were entered as a single aggregated entry at the end of the contract; this entry represents the prior five years of obligations for NASA’s contract with the Jet Propulsion Lab (JPL). CSIS has worked with NASA contract officials at the JPL and has determined that while separating out the aggregated total is not feasible, the \$8.7 billion will be moved back to 2003, which was the last year of the contract. CSIS would like to thank the contract officials at NASA HQ and at the JPL for their diligence and assistance in tracking down this data anomaly.



the decline in share is primarily the result of increasing obligations for ATD and “Operation of Government R&D Facilities” starting in the mid-to-late 2000s. As a share of overall HHS contract obligations, R&D has declined steadily throughout the period, from a high of 26% in 2004 to 13% in 2014. Figure 5 shows HHS R&D contract obligations by stage of R&D.



**Figure 5. HHS R&D Contract Obligations by Stage of R&D, 2000–2014**  
(FPDS; CSIS analysis)

Since 2009, as overall HHS contract obligations fell by 3%, HHS R&D contract obligations fell by 29%, albeit after a 33% increase between 2008 and 2009. Basic Research declined by 42% between 2009 and 2014, but that was primarily the result of a return to normal obligation levels after a one-year spike in 2009; between 2012 and 2014, as overall HHS R&D contract obligations were virtually flat, obligations for Basic Research increased by 16%. Obligations for Applied Research were relatively preserved (-10%), while obligations for ATD increased by 13%. ATD obligations were notably volatile during this period, doubling between 2010 and 2011, falling by a third in 2012, increasing by 144% in 2013, and then falling by 45% in 2014.

### Department of Energy

The DoE is unique among the major federal R&D contracting agencies in that only a small percentage of its R&D contracting portfolio actually goes to direct contracts for R&D. Rather, the vast majority of the DoE’s R&D contract obligations go to “Operation of Federal R&D Facilities,” mainly the various National Laboratories. Because of the nature of these contracts, CSIS has limited visibility to the nature of the R&D being performed, although



conversations with experts have indicated that most of the R&D activity in the National Laboratories would probably be categorized as Basic Research or Applied Research.<sup>6</sup>

The DoE's R&D contracting portfolio is also unique in that almost all of the obligations in recent years are under contracts that originated in 2008 or earlier. In 2014, for example, less than 2% of the \$14.5 billion in DoE R&D contract obligations came from contracts signed after 2008, and 35% came from contracts that originated in 2000 or earlier. As such, DoE R&D contracting data has limited explanatory value regarding the effects of the current drawdown, since almost all of the obligations in recent years come from options being exercised under contracts that originated before the drawdown began.

## How Has the Budget Drawdown Affected Federal R&D Contracting?

As part of this research effort, CSIS has conducted a review of the relevant literature, involving both the public and private sectors, to identify current theories on how declining resources would affect R&D contract spending. CSIS also consulted with experts in federal contracting and budgeting to validate the theories identified in the course of the literature review. From this analysis, the study team developed a number of hypotheses regarding how declining resources would affect federal R&D contracting overall, and the R&D contracting portfolios within agencies specifically.

This section looks at a selection of these identified hypotheses and evaluates whether the predictions made by the study team (based on the current understanding of the issue from the available literature) were borne out by the data on the current budget drawdown. The following are the five hypotheses that this section will examine:

1. Cuts in R&D due to budget drawdown will be done on a “salami slice” basis, rather than reflecting a thoughtful prioritization of resources.
2. Newer R&D contracts will bear a disproportionate share of cuts during budget drawdowns.
3. Budget drawdowns will lead to shifts away from early-stage, “seed corn” R&D towards mid-to-late-stage R&D tied to high-profile programs.
4. Large prime vendors will account for increasing shares of federal R&D during budget drawdowns.
5. During budget drawdowns, R&D will be increasingly funded out of non-R&D-focused budget accounts.

### ***Hypothesis 1: Cuts in R&D Due to Budget Drawdown Will Be Done on a “Salami Slice” Basis, Rather Than Reflecting a Thoughtful Prioritization of Resources.***

For the purposes of this hypothesis, the study team uses the term “salami slice” to refer to a series of cuts where a roughly equal portion is cut across the board, rather than having some portions of the portfolio relatively preserved or impacted. Given that sequestration, in particular, was implemented as an across-the-board cut, CSIS hypothesized that agencies would respond to budgetary pressures by taking roughly equal

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<sup>6</sup> The DoE totals for “Operation of Federal R&D Facilities” also likely include some production activity related to nuclear weapons, but CSIS has no way to reliably separate these out from the R&D activity undertaken as part of these contracts. As such, for the purposes of this analysis, CSIS will categorize the “Operation of Federal R&D Facilities” obligations in their entirety as R&D.



cuts across their R&D contracting portfolios. If this hypothesis were to hold true, the study team would expect to find that across the different stages of R&D and within different major components, cuts to R&D were roughly in parallel to the overall decline over the period, if not necessarily in each particular year.

### **Department of Defense**

The overall DoD R&D contracting portfolio did not show evidence that cuts were done on a “salami slice” basis. While Basic Research has declined roughly in parallel to overall DoD R&D contract obligations since 2012, Applied Research, ACD&P, and Operational Systems Development have all declined notably more slowly than overall DoD R&D. At the same time, contract obligations for ATD and SD&D have declined significantly more steeply than overall DoD R&D. As discussed in the Federal R&D Contracting in Context section, this does not appear to be the result of “thoughtful prioritization of resources;” rather, it appears that the disparate levels of cuts across the DoD’s R&D contracting portfolio are primarily the result of late-stage development programs for major weapons systems either maturing out of development or being cancelled, with a dearth of new major development programs starting in recent years.

Within the Army, R&D contract obligations declined notably more steeply than in the DoD overall since 2012. Army contract obligations for Basic Research and ACD&P have declined notably more slowly than overall Army R&D under sequestration and its aftermath. SD&D was nearly steady over that same period, but that is a factor of the near-complete disappearance of SD&D contract obligations prior to 2012 due to the cancellation of the FCS program and the Army’s inability to start and sustain new development programs for major weapons systems in recent years. Meanwhile, contract obligations for Applied Research, ATD, and Operational Systems Development all declined significantly more steeply than overall Army R&D.

Although the distribution of cuts is different within the Navy’s R&D contracting portfolio since 2012, the degree to which the cuts are unevenly distributed is similar to the Army. Between 2012 and 2014, Navy contract obligations for SD&D and Operational Systems Development declined roughly in parallel to overall Navy R&D. Obligations for Applied Research and ACD&P were relatively preserved, with Applied Research, in particular, declining at less than one-third the rate of overall Navy R&D. By contrast, obligations for Basic Research and ATD declined more steeply than overall Navy R&D.

Within the Air Force, contract obligations for Basic Research and Applied Research both declined at less than half the rate of overall Air Force R&D since 2012, while Operational Systems Development actually increased significantly. Meanwhile, obligations for ATD, ACD&P, and SD&D all declined notably more steeply than overall Air Force R&D, with SD&D declining at nearly double the rate.

Within the MDA’s R&D contracting portfolio, ACD&P declined at double the rate over overall MDA R&D since 2012, while Basic Research fell by over five times the overall MDA R&D rate of decline. During the same 2012–2014 period, both Applied Research and ATD saw notable increases.

### **NASA**

NASA’s R&D contracting portfolio saw a mild decline between 2012 and 2014, but much like the DoD and its major components, the cuts to NASA do not appear to have been done on a “salami slice” basis. Obligations for Basic Research and SD&D saw notable increases, while obligations for Applied Research, ATD, and ACD&P declined at rates between two and four times as steep as for overall NASA R&D.



## **HHS**

In the wake of sequestration and its aftermath, HHS R&D contract obligations were virtually stable between 2012 and 2014. But this stability masks wildly disparate increases and decreases between the categories of R&D that make up significant portions of the HHS R&D contracting portfolio. Obligations for Basic Research and ATD both increased significantly from 2012–2014, with the latter increasing by more than a third. Obligations for Applied Research declined steeply over the same period, while obligations for GOCO saw a moderate decline.

### ***Initial Findings***

The data provides no evidence to support the hypothesis the cuts in the wake of sequestration and its aftermath would be done on a “salami slice” basis; in fact, the data shows wildly divergent trends between different stages of R&D.

### ***Hypothesis 2: Newer R&D Contracts Will Bear a Disproportionate Share of Cuts During Budget Drawdowns.***

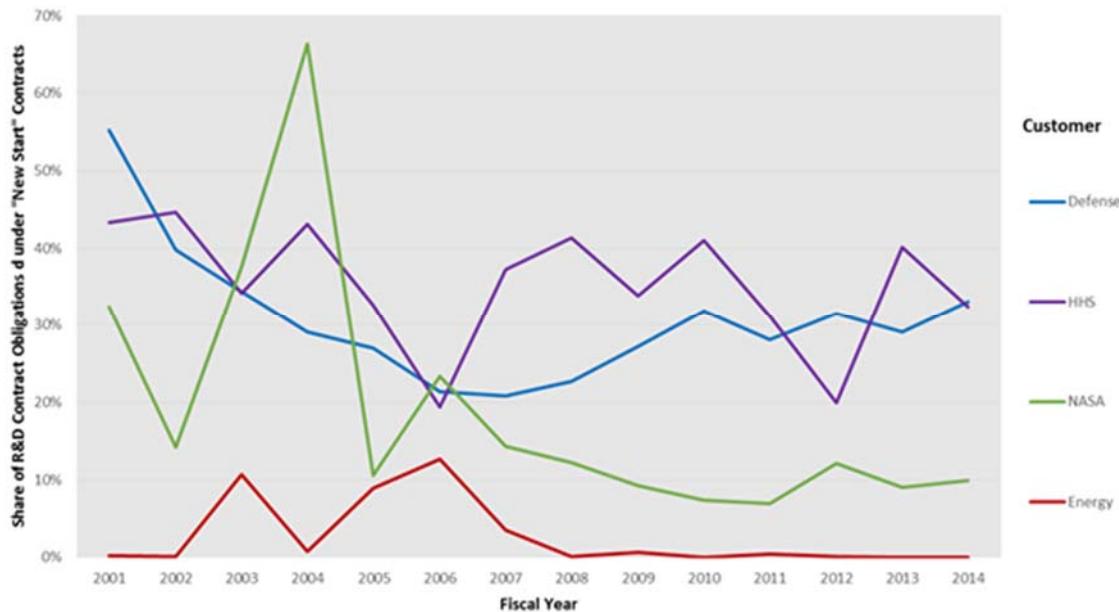
The basis of this hypothesis is the idea that established, ongoing R&D programs develop constituencies and stakeholders, both inside and outside of government, that have an interest in seeing the program continue and succeed. As such, when cuts have to be made during a budget drawdown, it makes sense that those constituencies and stakeholders would try to protect those established programs. CSIS thus theorized that in a time of budgetary downturn, newer R&D contracts would bear a disproportionate share of the declines in R&D contract obligations. If this hypothesis were true, CSIS would expect that, within the major R&D contracting agencies and their major components, the share of R&D contract dollars obligated under “new” contracts in each fiscal year would decline during the current budget drawdown. CSIS refers to these “new” contracts in each year as “new start” contracts.

Figure 6 shows the share of contract dollars in each fiscal year that was obligated under contracts originating in that fiscal year for each of the major R&D contracting agencies.<sup>7</sup>

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<sup>7</sup> Because FY2000 is the first year in the FPDS dataset that CSIS uses, it is excluded from this analysis, as all contract obligations in that year are shown as originating in FY2000, even if they come from a contract that began earlier.



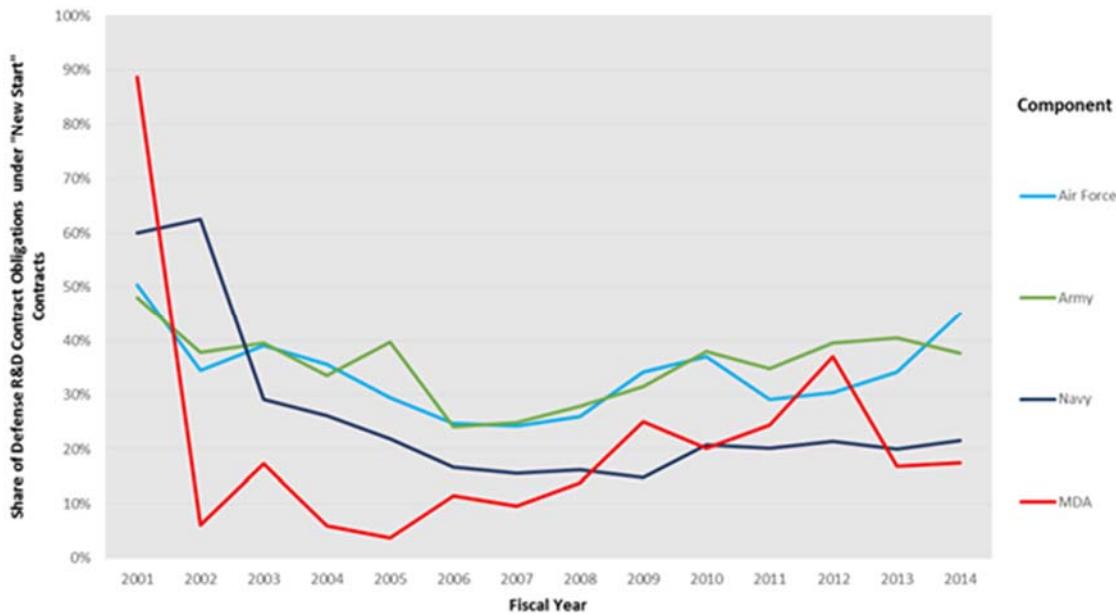


**Figure 6. Share of R&D Contract Obligations Under “New Start” Contracts, by Customer, 2001–2014**  
 (FPDS; CSIS analysis)

#### ***Department of Defense***

The overall DoD R&D contracting portfolio does not show a consistent trend of reduced obligations for “new start” contracts during the current budget drawdown. The share of DoD R&D contract obligations in each year awarded under “new start” contracts declined from 55% in 2001 to a low of 21% in 2007. The share began to increase in subsequent years, and that increase continued through the early years of the budget drawdown, rising to 32% by 2010. Over the next three years, that share fluctuated between 28% and 32%, peaking at 34% in 2014.

Figure 7 shows the share of R&D contract obligations awarded under “new start” contracts for each of the major DoD R&D contracting components.



**Figure 7. Share of Defense R&D Contract Obligations Under “New Start” Contracts, by Component, 2001–2014**  
(FPDS; CSIS analysis)

The share of Army R&D contract obligations under “new start” contracts declined, albeit not consistently, in the years prior to the current budget drawdown, falling from 48% in 2001 to 24% in 2006. The share obligated under “new start” contracts rose in subsequent years and continued to rise during the current budget drawdown, reaching a high of 41% in 2013 before falling back to 38% in 2014.

For the Navy, “new start” contract obligations accounted for over 60% of total R&D contract obligations in 2001 and 2002, but that share declined precipitously in 2003, to 29%. The share declined gradually over the next several years to 15% in 2009, but rose to 21% in 2010. Between 2010 and 2014, the share of Navy R&D contract obligations under “new start” contracts remained between 20% and 22%.

Within the Air Force’s R&D contracting portfolio, the share obligated under “new start” contracts fell from 50% in 2001 to 24% in 2007. The share increased over the next few years to 37% by 2010, fell to 29% in 2011, and increased to 45% by 2014.

For the MDA, after the anomalous 2001, the share of contract obligations under “new start” contracts fluctuated below 20% until 2009, when the share rose to 25%. After a drop to 20% in 2010, the share of MDA R&D contract obligations under “new start” contracts rose to 37% by 2012 before dropping back below 20% in 2013 and 2014.

### NASA

NASA’s share of R&D contract obligations under “new start” contracts was highly volatile in the early-to-mid-2000s, but since 2008, that share has remained between 6% and 12% each year, with no discernable pattern (aside from relative stability) during the budget drawdown.

### HHS

HHS R&D contract obligations under “new start” contracts have been highly volatile throughout the 2001–2014 period, likely a function of the smaller obligation totals involved.

Since 2008, the “new start” share has fluctuated between 32% and 41% in all but one year (20% in 2012); like NASA, aside from that relative stability, there is no discernable pattern present.

### ***Department of Energy***

The DoE data in Figure 6 shows the degree to which the DoE R&D contracting portfolio is dominated by long-running contracts. Between 2008 and 2015, “new start” contracts never exceeded 0.7% of total DoE R&D contract obligations in any year and accounted for 0.02% or less in four of the last five years.

### ***Initial Findings***

The data provides no support for the hypothesis that “new start” R&D contract obligations were disproportionately affected during the budget drawdown; rather, in each case, “new start” R&D contract obligations either were stable, increased, or else showed no discernable trend over the period.

### ***Hypothesis 3: Large Prime Vendors Will Account for Increasing Shares of Federal R&D During Budget Drawdowns.***

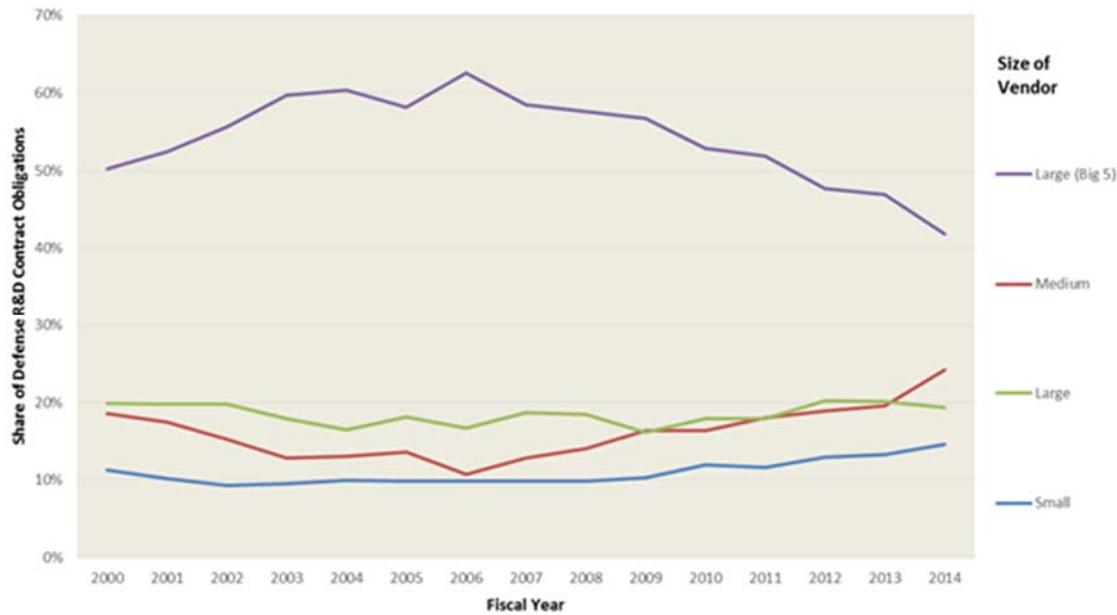
This hypothesis can be considered a companion to Hypothesis 3, because they could both be effects of a similar cause. Because large, high-profile, mid-to-late stage R&D programs are the most likely to have developed constituencies and stakeholders that would fight to protect them during a budget drawdown, Hypothesis 2 theorized that those R&D contracts would be relatively protected. And since those large, high profile R&D programs are likely to be performed by large, high-profile prime vendors, Hypothesis 3 theorizes that R&D contract obligations to those same large, high-profile prime vendors would be relatively preserved.

### ***Department of Defense***

Figure 8 shows DoD R&D contract obligations to prime vendors, from 2000–2014, broken down by the share going to the different vendor size categories.<sup>8</sup>

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<sup>8</sup> CSIS classifies vendors into four size categories: “Small” vendors follow the government’s classification for small businesses, with a couple of adjustments implemented by the study team; “Large” vendors are any vendors with over \$3 billion in annual revenue from all sources; and “Medium” vendors are any vendors that are neither small nor large. The fourth category, the “Big 5” vendors (Lockheed Martin, Boeing, Northrop Grumman, Raytheon, and General Dynamics), are separated out from “Large” due to the outsized role they play in federal contracting overall.



**Figure 8. Defense R&D Contract Obligations by Size of Vendor, 2000–2014**  
(FPDS; CSIS analysis)

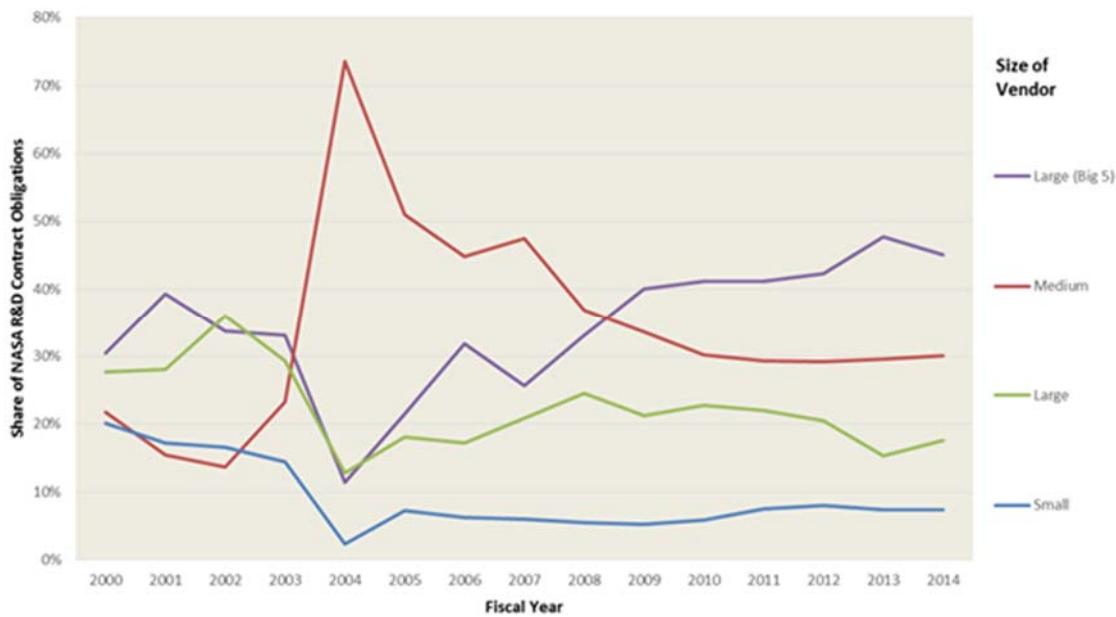
Contrary to Hypothesis 3, the DoD has actually seen a dramatic decline in the share of contract obligations going to large prime vendors. While the “Large” category has held steady through the drawdown and throughout most of the 2000–2014 period, the share of R&D contract obligations going to the Big 5 vendors has fallen from 57% in 2009 to 42% in 2014. This is primarily the result of the previously discussed five-year trough in the DoD’s development pipeline for major weapons systems: In recent years, as many large development programs were either cancelled or matured into production, the DoD has been largely unable to start and sustain new large-scale development programs. And because those large-scale development programs for major weapons systems are predominantly performed by the Big 5 vendors, those vendors have borne the brunt of the decline in DoD R&D contract obligations.

Unsurprisingly, this trend is present to an even greater degree within Army R&D. While the share of Army R&D contract obligations awarded to large vendors has remained relatively steady in recent years (aside from a brief spike in 2012 and 2013), the share awarded to the Big 5 vendors has fallen from 48% in 2009 to just 20% in 2014. Due to the Army’s particularly severe issues with starting and sustaining new development programs in recent years, this trend is unlikely to reverse in the near future.

The Navy and Air Force have seen declines in the share of R&D contract obligations to the Big 5 vendors more in line with the trend for DoD R&D overall. Within the Navy’s R&D contracting portfolio, the share of R&D contract obligations going to the Big 5 vendors fell from 65% in 2009 to 37% in 2014. For the Air Force, the share going to the Big 5 vendors fell from 47% in 2009 to 31% in 2014. In both cases, the share awarded to large vendors has been relatively stable over the period.

### NASA

Figure 9 shows NASA R&D contract obligations from 2000–2014, broken down by the share going to the different vendor size categories.



**Figure 9. NASA R&D Contract Obligations by Size of Vendor, 2000–2014**  
(FPDS; CSIS analysis)

Unlike the DoD and its major components, NASA actually does show increasing shares of R&D contract obligations going to large prime vendors. This increase, however, began before the current budget drawdown; the Big 5 vendors accounted for only 26% of NASA contract obligations in 2007, but that share rose to 48% by 2013 before a slight decline in 2014. This increase in Big 5 share is primarily concentrated in Basic Research (from 11% in 2007 to 47% in 2013) and SD&D (from 7% in 2007 to 78% in 2014.) Thus, it appears that the rising share of NASA R&D contract obligations going to large prime vendors is not attributable to factors relating to the budget drawdown.

#### **HHS**

The Big 5 vendors have never accounted for more than 1% of HHS R&D contract obligations. The HHS has seen an increase in the share of R&D contract obligations awarded to large vendors, but this is a trend that started prior to the current budget drawdown. The primary factor in this increase is the increase in contract obligations for GOCO in 2008 and 2009, of which over three-quarters were awarded to large vendors. None of the other major categories within the HHS R&D contracting portfolio have seen consistent and notable increases or decreases in the share of obligations awarded to large prime vendors during the current drawdown.

#### **Initial Findings**

The data provides no support for the hypothesis that large prime vendors would see increasing shares of R&D contract obligations during the current budget drawdown. In fact, in most cases, the largest vendors have seen their shares decline precipitously.

#### ***Hypothesis 4: During Budget Drawdowns, R&D Will Be Increasingly Funded Out of Non-R&D-Focused Funding Accounts.***

The theory of Hypothesis 4 is that, as budgets decline, agencies may look to fund R&D out of budget/funding accounts that are not traditionally R&D-focused in order to make up for funding shortfalls in the R&D-focused accounts and preserve funding levels for high-priority R&D programs. If this hypothesis were accurate, the study team would expect to see

increases in the share of R&D contracting obligations funded out of particular funding accounts that were not traditionally the primary funding sources for R&D contracts within the agency.

A couple of methodological notes related to this analysis:

- The fields that allow for cross-walking between contract obligations and budget data only began to be filled in reliably in FY2011 for non-DoD agencies and FY2012 for the DoD.
- CSIS focuses on funding accounts, rather than the higher-level budget accounts, because of the increased data granularity and also because there is no consistent budget account schema between agencies.

### ***Department of Defense***

Unsurprisingly, nearly three-quarters of DoD R&D contract obligations are funded out of the various DoD Research, Development, Test, and Evaluation (RDT&E) accounts, with the Air Force and Defense-wide accounts accounting for the largest shares. Since 2012, the share of DoD R&D contract obligations funded out of the Defense-wide RDT&E account has risen from 21% to 28%, and the share funded out of the Air Force RDT&E account increased from 21% to 23%. Meanwhile, the share funded out of the Navy's RDT&E account fell from 18% to 15%, while the share funded out of the Army's RDT&E account fell from 7% to 6%.

For the other DoD funding accounts with non-trivial levels of R&D contract obligations, there was a mix of increases and decreases, though most were relatively stable. The share of R&D contract obligations funded out of the Navy's Aircraft Procurement account doubled from 2% to 4%, while the share funded out of the Air Force's Missile Procurement account fell from 4% to 1%. Additionally, the share funded out of the Army's Operations and Maintenance (O&M) account fell from 5% to 3%.

### ***HHS***

For the most part, the shares of HHS R&D contract obligations funded out of particular HHS funding accounts have been relatively consistent from 2011–2014, with a couple of exceptions. The share funded out of the National Institute of Health's (NIH) National Institute of Drug Abuse rose from 1% in 2011 to 4% in 2014, while the share funded out of the main NIH account fell from 25% in 2012 to between 19% and 20% in 2013 and 2014.

### ***NASA***

Unlike the other two agencies, there have been significant shifts in the distribution of R&D contract obligations within NASA's major funding accounts. The share of R&D contract obligations funded out of the Cross Agency Support account rose from 11% in 2011 to 22% in 2014, and the share funded out of the general Science account rose from 17% to 28%. Meanwhile, the share funded out of the Exploration account fell from 27% to 20%, the share funded out of the Human Space Flight account fell from 11% to 7%, and the share funded out of the Science (Aeronautics and Exploration) account fell from 19% to 0%.

### ***Initial Findings***

Though the data is mixed, there is no consistent trend that supports the hypothesis that R&D contract obligations are being increasingly funded out of non-traditional accounts during the current budget drawdown.



## Final Thoughts and Next Steps

The data highlighted in this report clearly shows that, while federal R&D contract obligations have declined dramatically overall, that decline has not been consistent across the major R&D contracting agencies and their major components, or across the different stages of R&D. Moreover, with very narrow exceptions, none of the predictions made by the study team regarding the effect of the downturn on federal R&D contracting, based on a review of the literature and consultations with experts, have been borne out.

These initial results should give analysts pause, as the data indicates that the conventional wisdom regarding how a budget drawdown would affect agencies' R&D contracting portfolios is flawed. While CSIS found no evidence that the cuts to R&D reflect a thoughtful, top-to-bottom prioritization of resources, there is also no indication that the cuts were done on a "salami-slice" basis, or that newer or earlier-stage projects were sacrificed to protect later-stage programs with more entrenched stakeholders. As a result, the concerns about "seed corn" R&D being disproportionately affected by the budget drawdown also appear to be unfounded, and the predicted rise of market share for large prime vendors has not only not occurred, but has developed strongly in the opposite direction.

For the DoD, the key finding from this data is the existence of a five-year trough in the development pipeline for major weapons systems. The Air Force looks likely to buck that trend in the coming years as spending for the Long Range Strike Bomber program ramps up. However, the Navy's continued pushing back of development timelines for programs like the Ohio-replacement ballistic submarine due to budget constraints, and the Army's continued uncertainty about future missions, requirements, and resources, indicate that the overall trough is likely to continue into the foreseeable future.

In the next stages of this project, the study team will test additional hypotheses and disaggregate federal agency and military department figures in a manner appropriate to each hypothesis, for example, breaking out annual or quarterly results, looking at individual major projects and facilities, or studying funding accounts. The study team plans to expand the analysis of federal R&D contracting trends, both in terms of contract characteristics and the supporting vendor base, as well as looking at trends in R&D-related grants to provide additional context. CSIS will also continue to work to identify and interview relevant experts to help understand the causes and effects of the trends identified within the data.

## Disclaimer

The Center for Strategic and International Studies (CSIS) does not take specific policy positions; accordingly, all views expressed in this presentation should be understood to be solely those of the author(s).





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# **Federal Research and Development Contract Trends and the Supporting Industrial Base, 2000-2015**

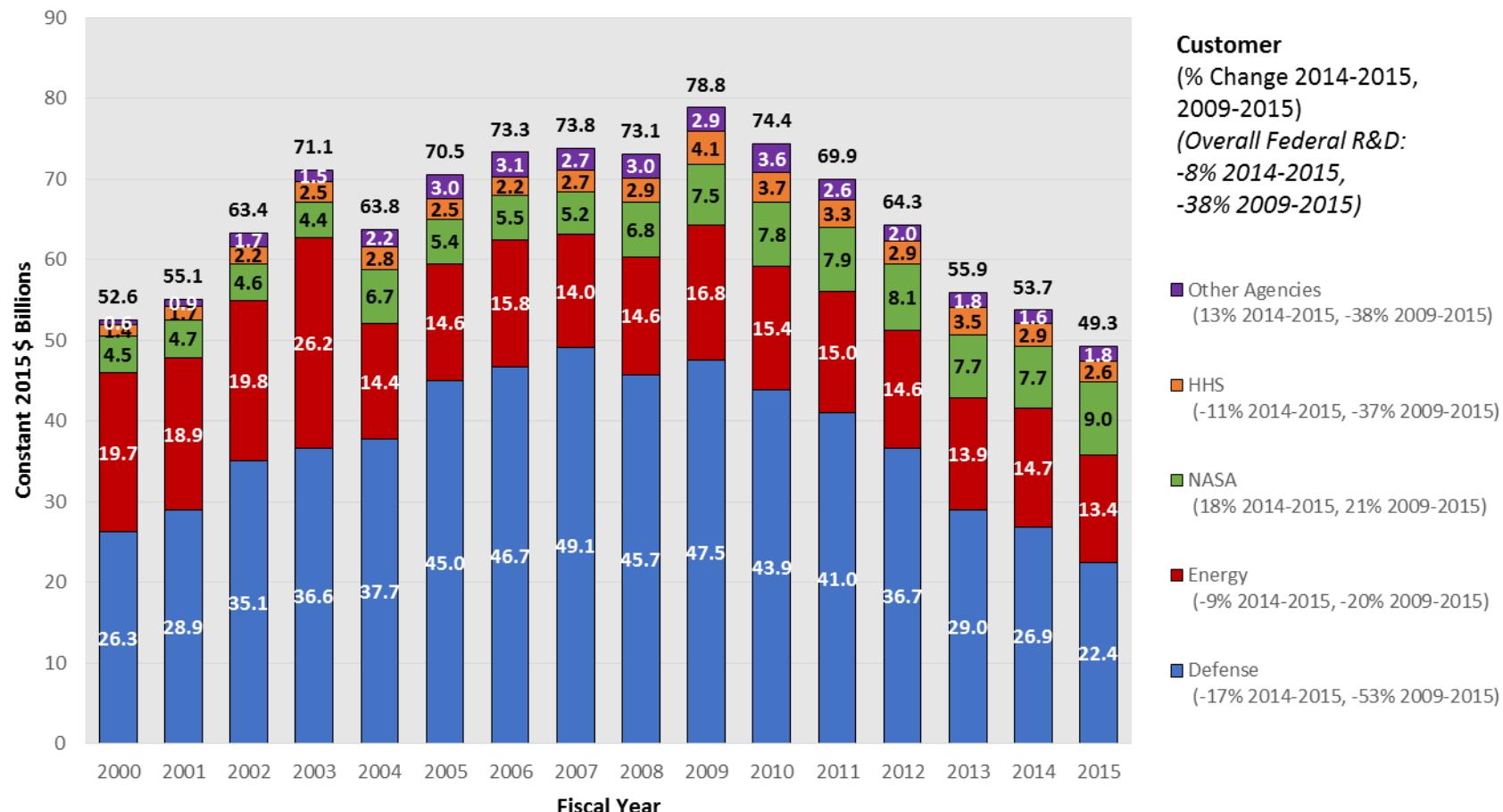
**Jesse Ellman**  
**Defense-Industrial Initiatives Group**  
**Center for Strategic and International Studies**

**May 4, 2016**

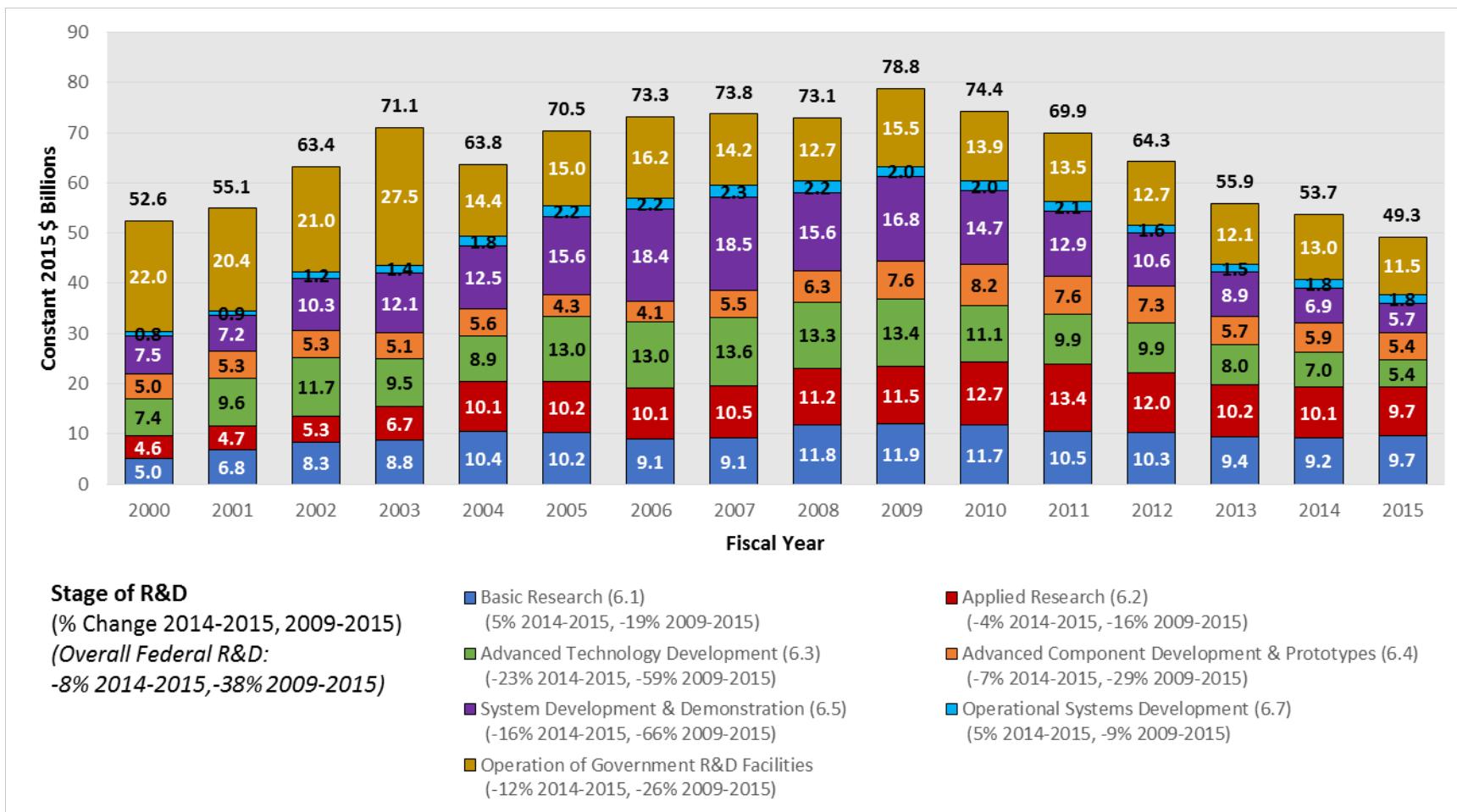
## Methodology

- The Federal Procurement Data System (FPDS) was the primary source for contract data used in this analysis.
- Federal regulations require only that all unclassified prime contracts worth \$3,000 and above be reported to FPDS.
- FPDS data are constantly being updated, including those for back years. As a consequence, the dollar totals for a given year may have changed since the data was downloaded.
- All dollar figures are in constant 2015 dollars.

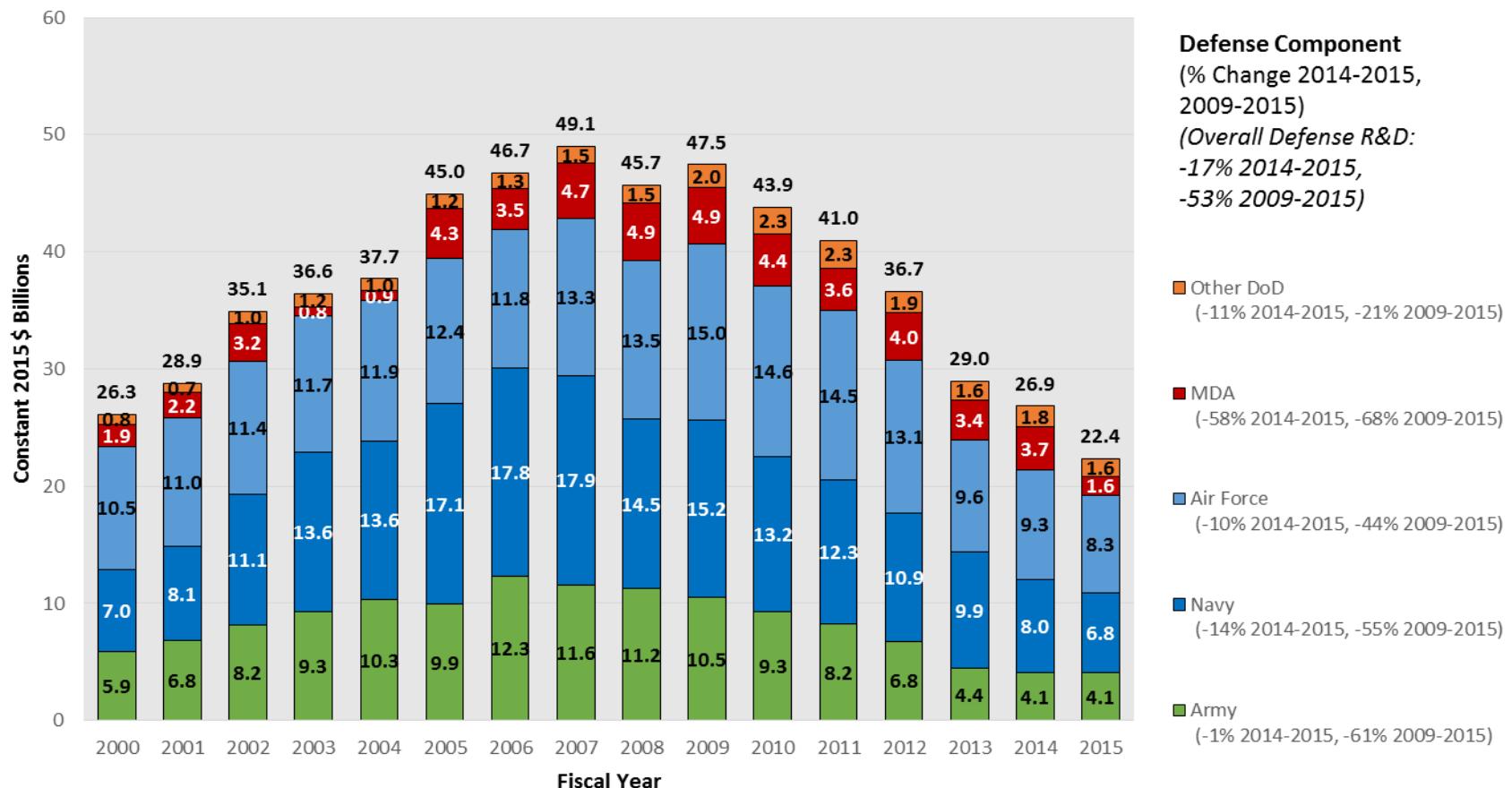
## Overall Federal R&D Declines by Nearly Two-Fifths Since 2009



## Impact of Budget Drawdown Varies Between Stages of R&D



## Defense R&D Contracts Decline by More than Half Since 2009; MDA R&D Falls Nearly Three-Fifths in 2015

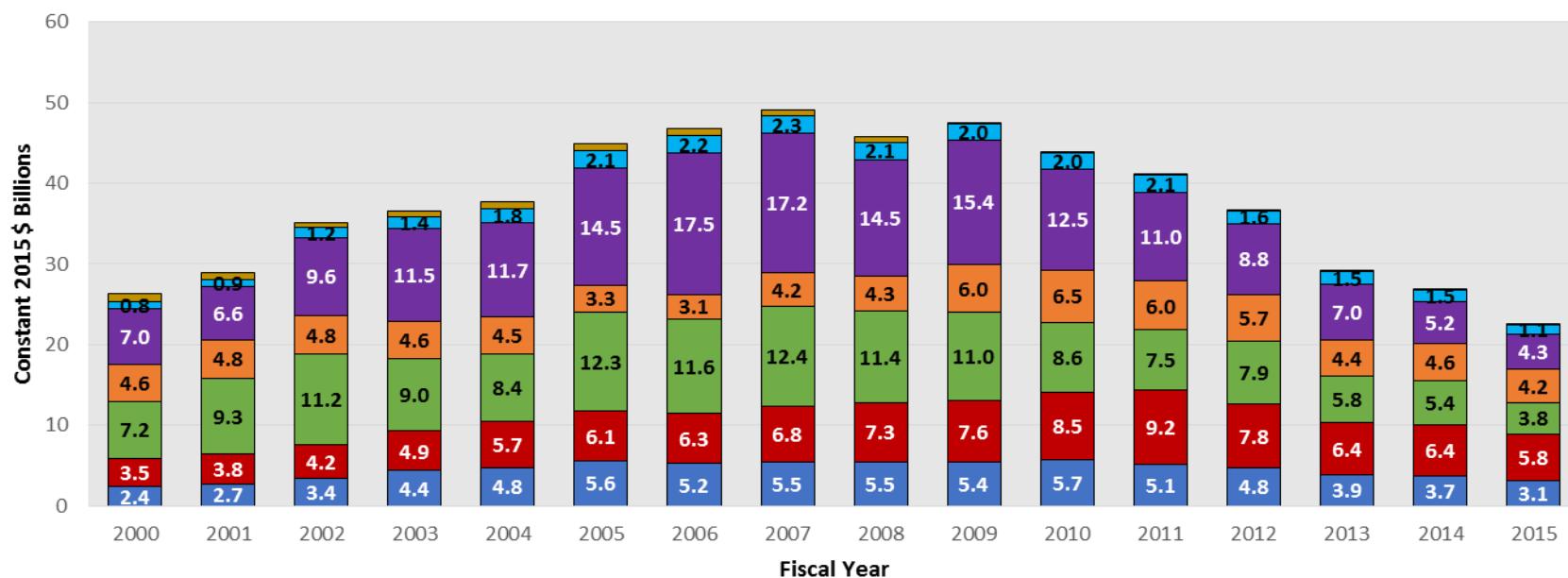


## Research Hypotheses

1. Budget drawdowns will lead to shifts away from early-stage, “seed corn” R&D, towards mid-to-late-stage R&D tied to high-profile programs.
2. Cuts in R&D due to budget drawdown will be done on a “salami slice” basis, rather than reflecting a thoughtful prioritization of resources.
3. Newer R&D contracts will bear a disproportionate share of cuts during budget drawdowns.
4. Large prime vendors will account for increasing shares of federal R&D during budget drawdowns.

**Hypothesis 1: Budget drawdowns will lead to shifts away from early-stage, “seed corn” R&D, towards mid-to-late-stage R&D tied to high-profile programs.**

## Overall DoD “Seed Corn” R&D Preserved During Downturn; Mid-to-Late-Stage R&D Declines Dramatically



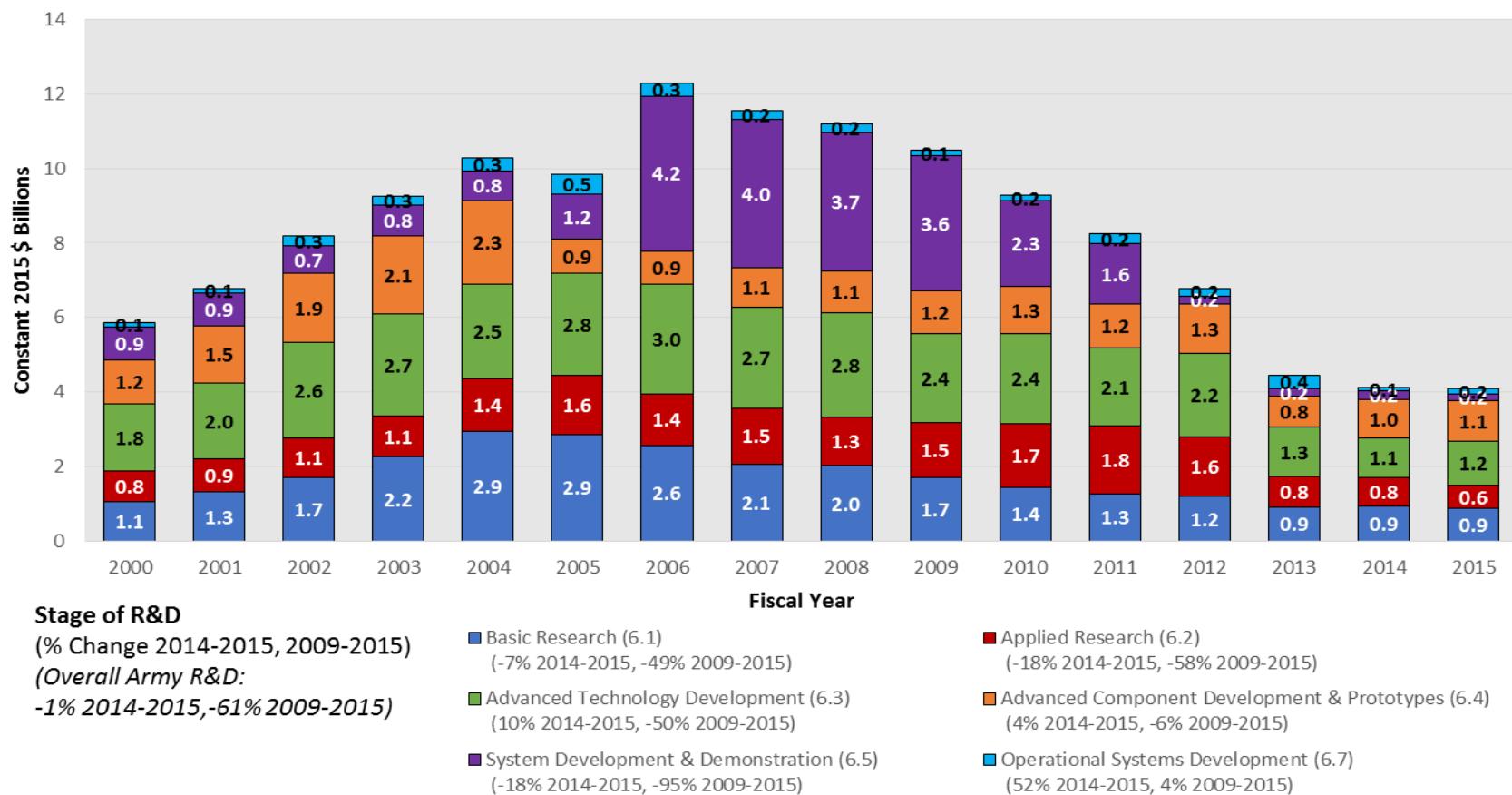
### Stage of R&D

(% Change 2014-2015, 2009-2015)  
*(Overall Defense R&D:  
-17% 2014-2015, -53% 2009-2015)*

- Basic Research (6.1)  
(-14% 2014-2015, -42% 2009-2015)
- Advanced Technology Development (6.3)  
(-29% 2014-2015, -65% 2009-2015)
- System Development & Demonstration (6.5)  
(-18% 2014-2015, -72% 2009-2015)
- Operation of Government R&D Facilities  
(11% 2014-2015, -65% 2009-2015)

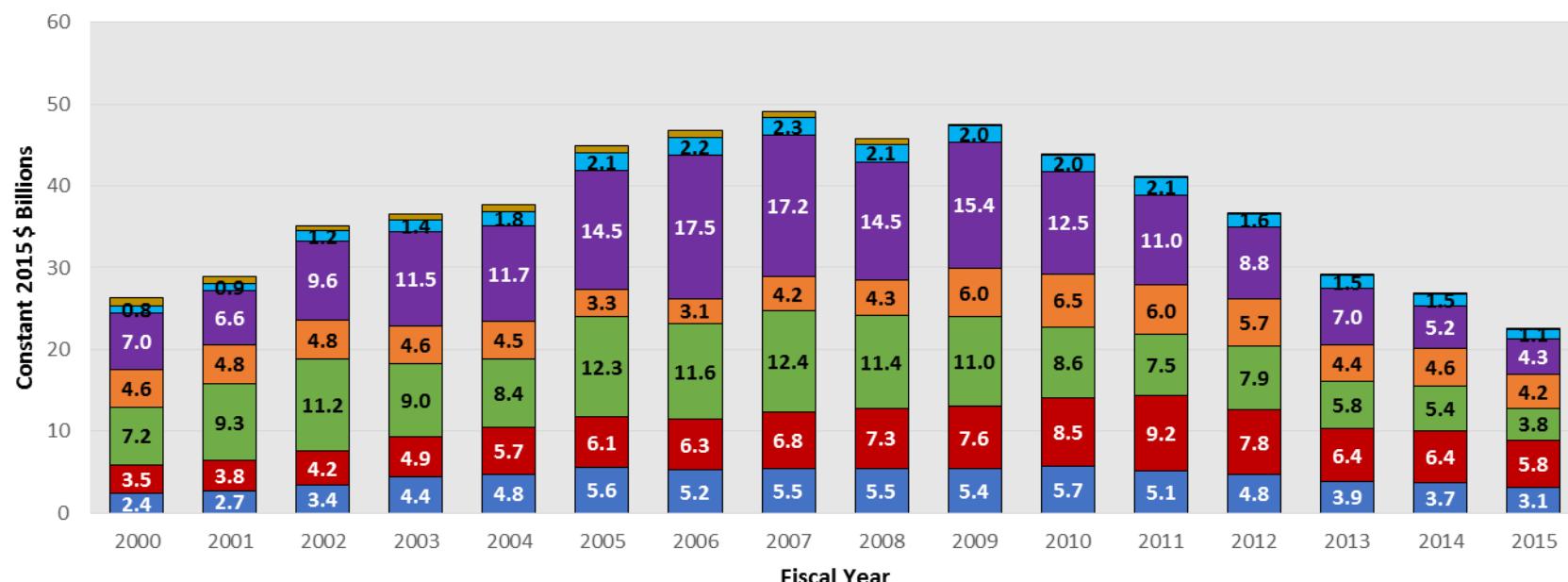
- Applied Research (6.2)  
(-9% 2014-2015, -23% 2009-2015)
- Advanced Component Development & Prototypes (6.4)  
(-10% 2014-2015, -31% 2009-2015)
- Operational Systems Development (6.7)  
(-26% 2014-2015, -45% 2009-2015)

## Army Mid-to-Late-Stage R&D Virtually Disappears; Six-Year Trough in MDAP Development Pipeline



**Hypothesis 2: Cuts in R&D due to budget drawdown will be done on a “salami slice” basis, rather than reflecting a thoughtful prioritization of resources.**

## Sequestration Impact on Overall DoD R&D Contracting Varies Significantly Between Stages of R&D



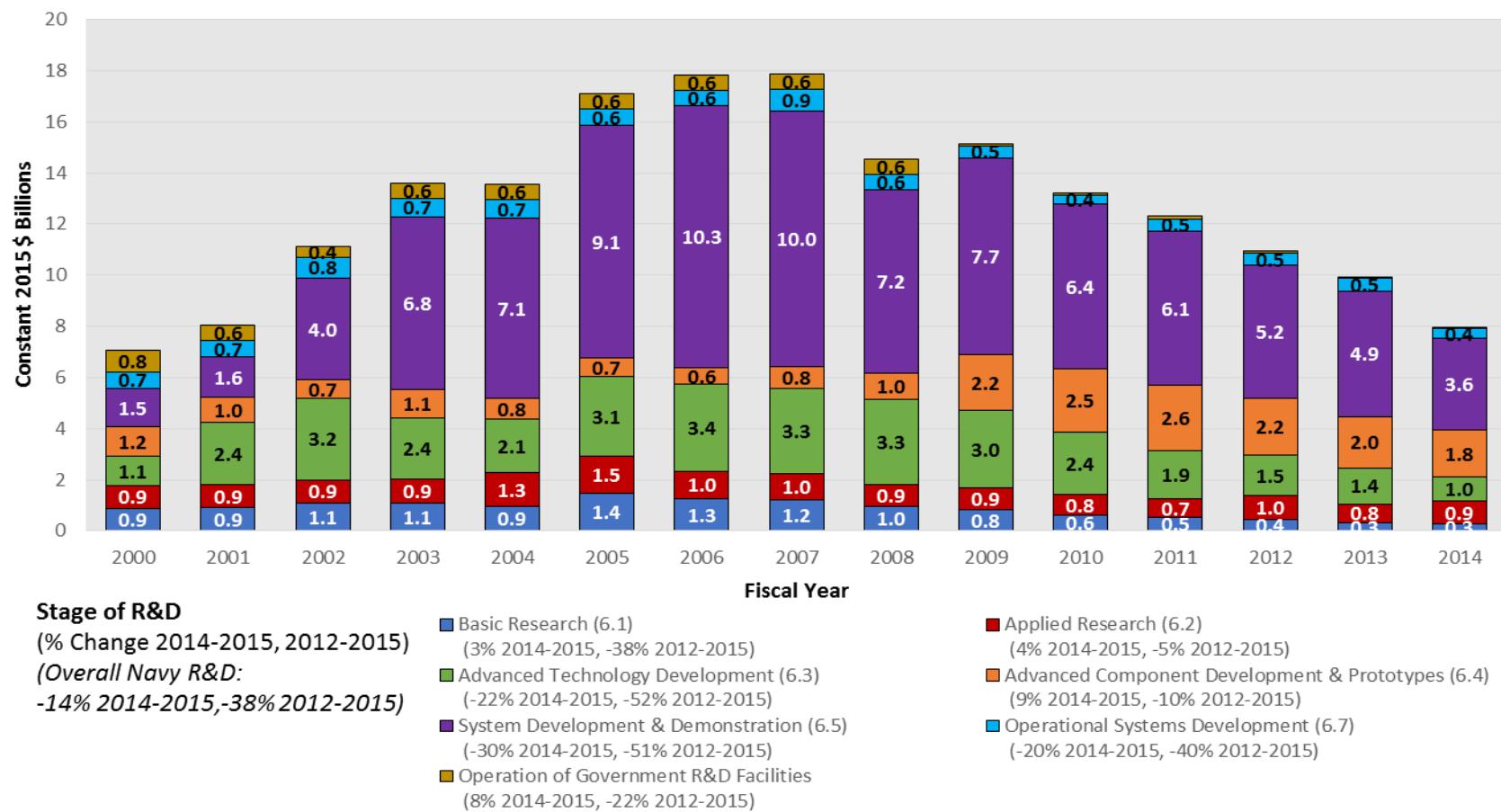
### Stage of R&D

(% Change 2014-2015, 2012-2015)  
(Overall Defense R&D:  
-17% 2014-2015, -39% 2012-2015)

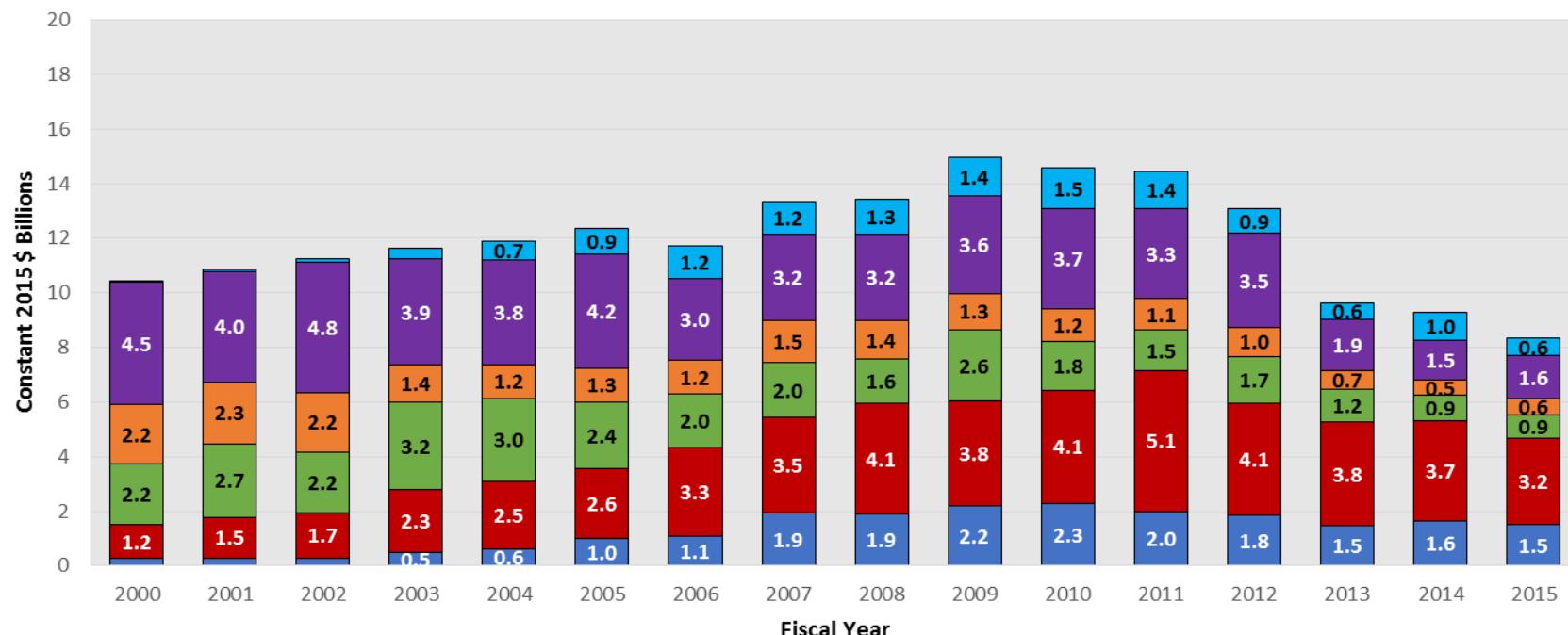
- Basic Research (6.1)  
(-14% 2014-2015, -34% 2012-2015)
- Advanced Technology Development (6.3)  
(-29% 2014-2015, -51% 2012-2015)
- System Development & Demonstration (6.5)  
(-18% 2014-2015, -51% 2012-2015)
- Advanced Component Development & Prototypes (6.4)  
(-10% 2014-2015, -27% 2012-2015)
- Operational Systems Development (6.7)  
(-26% 2014-2015, -30% 2012-2015)

- Applied Research (6.2)  
(-9% 2014-2015, -25% 2012-2015)
- Operation of Government R&D Facilities  
(11% 2014-2015, -20% 2012-2015)

## Trough in Navy MDAP Development Pipeline Likely to Persist Until FY2019



## Air Force R&D Likely to Exit MDAP Development Trough As B-21 Program Progresses



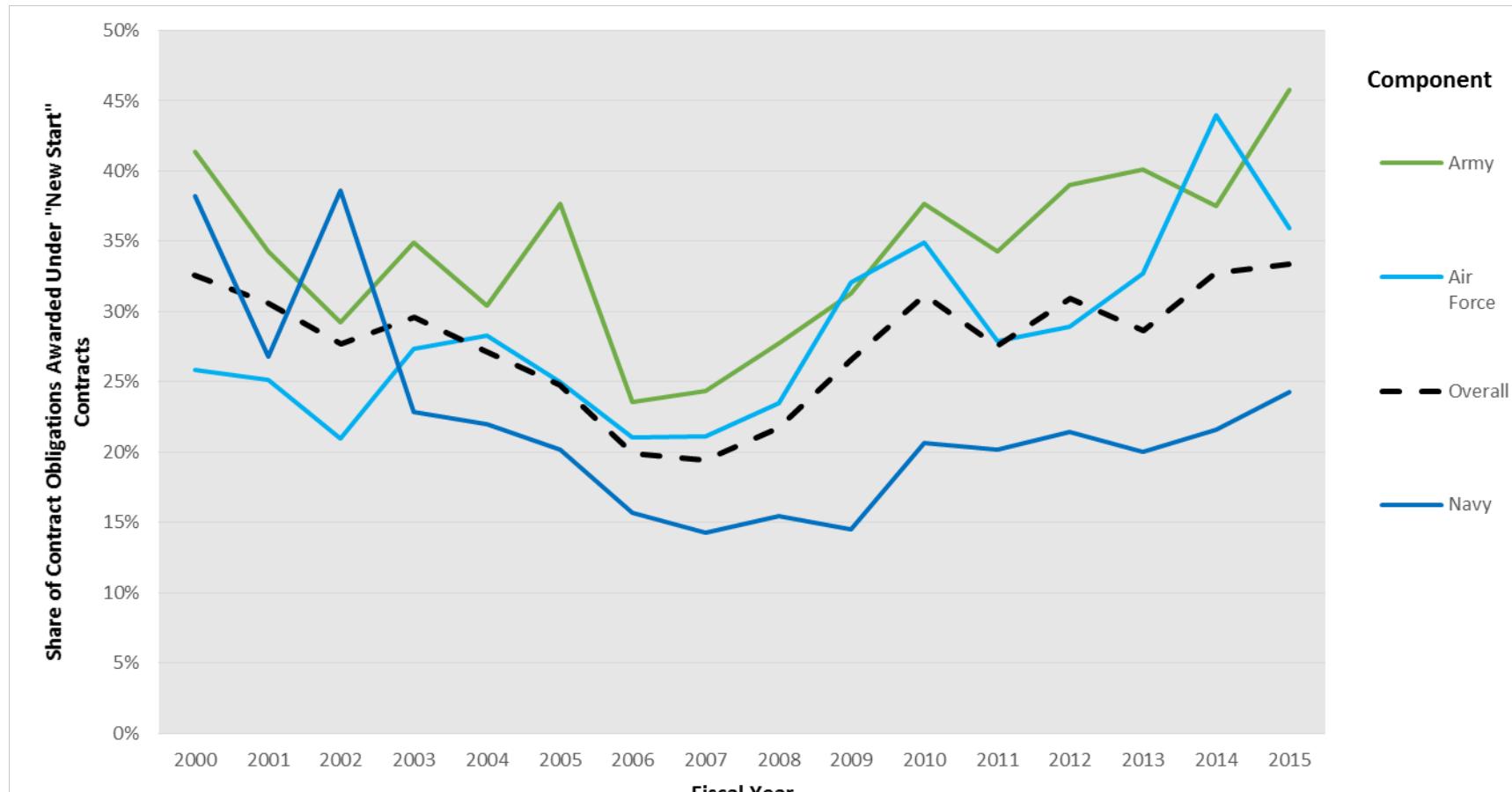
### Stage of R&D

(% Change 2014-2015, 2012-2015)  
*(Overall Air Force R&D:  
-10% 2014-2015, -36% 2012-2015)*

- Basic Research (6.1)  
(-8% 2014-2015, -18% 2012-2015)
- Applied Research (6.2)  
(-14% 2014-2015, -23% 2012-2015)
- Advanced Technology Development (6.3)  
(-8% 2014-2015, -50% 2012-2015)
- Advanced Component Development & Prototypes (6.4)  
(13% 2014-2015, -43% 2012-2015)
- System Development & Demonstration (6.5)  
(5% 2014-2015, -55% 2012-2015)
- Operational Systems Development (6.7)  
(-36% 2014-2015, -27% 2012-2015)

**Hypothesis 3: Newer R&D contracts will bear  
a disproportionate share of cuts during  
budget drawdowns.**

## Across DoD, Share of R&D Contract Obligations Under “New Start” Contracts Increases During Budget Drawdown



**Hypothesis 4: Large prime vendors will account for increasing shares of federal R&D during budget drawdowns.**

## Largest Prime Vendors See Historically Low Market Share of Defense R&D

